

CLAIMS**What is claimed is:**

1. A method for a systematic approach to forming experimental designs for large, complex systems, the method comprising:

- 5 (a) generating and developing an idea for a product;
 (b) develop an experimental design for the product, wherein the experimental design includes:

- 10 (c) determining critical variables for the product;
 (d) setting a design matrix $U_k = 0$ and $k = 0$;
 (e) generating a base design matrix X ;
 (f) running $Y(P) = (I - B(B^T B)^{-1} B^T)[(X P) // U]A$ & Wynn's criterion,
where P is a permutation matrix, I is an identity matrix, B is a blocking matrix, B^T is a transposed matrix of B , and A is a matrix composed of causal map-based coefficients; and
 (g) creating a design matrix U_k .

- 15 2. The method of Claim 1, wherein step (b) further includes:

- (h) setting $k \leftarrow k + 1$;
 (i) running an algorithm to choose the best of random column permutations matrices P ;
 (j) running an algorithm to choose the best column permutation matrix P that is near a previous solution; and
 (k) setting $U_k \leftarrow [XP^k \text{ with rows from } U_{k-1} \text{ appended}]$.

- 25 3. The method of Claim 2, wherein step (b) further includes:
 (l) determining whether the design U_k is at desired size; and
 (m) if the design U_k is not at the desired size repeating steps (h) through (m) until step (l) indicates that the design U_k is at the desired size.

- 30 4. The method of Claim 2 wherein step (b) further includes (n) setting the experimental design using U_k if step (l) indicates that the design U_k is at the desired size.

5. The method of Claim 4 further including:
 (o) manufacturing prototype wafers using the experimental design U_k ;
 (p) determining model responses from the prototype wafers;

(q) determining whether the model responses are adequate; and
(r) if the model responses are not adequate repeating steps (f) through (r) until step (q) indicates that the model responses are adequate.

5 6. The method of Claim 5 further comprising:

(s) assess and propose manufacturing tolerances for the design U_k ;
(t) determine if the proposed manufacturing tolerances are manufacturable; and
(u) if the manufacturing tolerances are not manufacturable repeating steps (b) through (t) until it is determined that the manufacturing tolerances are manufacturable.

10

7. The method of Claim 6 further comprising (v) sending the design U_k to production if it is determined that the manufacturing tolerances are manufacturable.

15 8. The method of Claim 7 wherein step (e) includes:

(w) creating a causal network diagram using information determined in step (c);
(x) creating an internode link-count distance matrix using information from step (w);
(y) creating a causal map using information from step (x);
(z) identifying response nodes from the causal map created in step (y); and
20 (aa) calculating map-based coefficients from the information in the causal map.

25

30